TPM541 series EVK USER GUIDE

Revision 1.4 Oct. 2020

Specifications are subject to change without notice and should not be construed as a commitment by Sercomm Corporation

 $\mathsf{Copyright} @$ 2017 by Sercomm Corporation ${\circledast}$ All rights reserved.

Frequency Bands

- One SKU for all, Supported Bands are configurable (B2/3/4/5/8/12/13/20/25/26/28)
- Only Bands 2/4/12 are enabled and available for this device; all other bands are disabled via software when sold/marketed to the USA

Data

- Data rate: Max throughput UL/DL (23dBm): UL: 375kbps/DL: 300kbps (peak)
- Protocol stack: COAP*/IPV4/IPV6/MQTT*/HTTPS*/LWM2M PPP/UDP/TCP/TLS/DTLS
- Firmware Download Method: UART, FOTA

Electrical Specification

 Maximum RF output power: 23 dBm (tolerance 20.3~25dBm)

Power Consumption

- PSM flow: 1.3uA@3.6V
- eDRX (81.92s): 40uA@3.6V
- I-DRX(1.28s): 1.5mA@3.6V
- Transmission (23dBm): 150mA@3.6V

Interfaces

- 3 x UART port (1 reserve for option)
- 1 x USIM port
- 1 x PCM*
- 18 x GPIO (maximum)*
- 1 x USB 2.0*
- 2 x ADC*
- 1 x I2C

*Reserved for the SKU supporting embedded MCU.

General Features

- LTE eDRX and PSM supported
- Low power consumption for longer battery life

Key Benefits

- Extremely Compact Form-Factor
- Ultra Low Power Consumption
- OpenCPU & Rich Interface Design for System on Module
- Multiple Internet Service Protocols Supported
- LTE-M and NB-IoT Dual Mode Supported
- One for All Design Supporting Multibands
- Embedded GNSS and Cellular Positioning Technology

Temperature Range:

■-40~+85°C

Supply voltage Range: •3.1~4.3V

Package:

- LGA, 104 pads
- Dimension: 13.4 x 14.6 x 1.85mm
- Weight: 1.0g

AT command:

■3GPP Rel.13 LTE Cat-M1 compliant

Applications

- Utilities: Smart Metering, Smart City, Smart Grid
- Tracking: Asset, People, Pet Trackers
- Remote Monitoring: Traffic, Environmental, Agricultural

Table of contents

Data	2
Electrical Specification	2
Power Consumption	2
Interfaces	2
General Features	2
Temperature Range:	2
Supply voltage Range:	2
Package:	2
AT command:	2
Applications	2
1. Introduction	2
1.1. Document Purpose	2
1.2. Kit contents	2
2. EVK functions introduce	3
2.1. EVK Interfaces	3
3. Starting with TPM541 series EVK	4
3.1. Hardware preparation and setup	4
3.2. Software preparation and setup	5
3.3. Starting to access EVK and TPM541	5
4. Button/Jumper introduce	6
4.1. RECOVERY button :	6
4.2. RESET button :	6
4.3. WAKEUP Jumper :	6
4.4. JP18 :	6
5. LED status	7
5.1. Module_PWR1 LED:	7
5.2. Module_LED1:	7
5.3. Module_LED2:	7
6. Special hardware configuration pins	8
6.1. SWD(JP17):	8
6.2. Isolation control(JP3):	8
6.3. Debug Selection(JP12):	8
6.4. Anti Tamper(JP11): TBD	8
7. RF matching diagram example	9
8. Firmware Upgrade	
8.1. Install RK firmware image	
8.2. Environment setup	
8.3. Firmware upgrade with ImageBurnTool	
9. Message view and Debug view usage	18
9.1 Configuration Tool Setup	18
9.2 Debug view	20
9.3. Message view	21
9.4 WiresbarkMSGview	21
9.5. Collect Logs of modem	21 20
- FCC Caution	



1. Introduction

1.1. Document Purpose

The purpose of this document is to introduce TPM541 series EVK and to provide a design reference. EVK also enables users to make a prototype on TPM541 platform which resembles the actual target during the design and build phases of a project. It makes the design efforts of a user simple, cost-effective and fast. Various interfaces which is included on the board make the development board ideal for a wide variety of applications. The EVK leverages the capability of the TPM541 LTE Cat. M1 cellular module and provides access to a variety of interfaces including UART, USB, USIM.

1.2. Kit contents

- Three USB to Micro USB Cables
- TPM541 series EVK
- One SMA-type LTE Dipole Antenna
- One SMA-type GPS Antenna (except TPM541S)



Figure 1.2 Kit contents



2. EVK functions introduce

2.1. EVK Interfaces

Table 2.2 lists TPM541 series available interfaces on EVK for reference .

Interface	Note
UARTO/J3	AT commands UART interface, default baud rate: 115200
UART1/J2	Console Log UART interface, default baud rate: 115200
UART2/J7	CLI/Firmware upgrade UART interface, default baud rate: 115200
USIM/J17	SIM card slot, supports 3FF, micro SIM card
JP5	UART0 to USB/external MCU switch jump.
JP2	UART1 to USB/external MCU switch jump.
JP1	UART2 to USB/external MCU switch jump.
J19	Reserved
S2	Power switch when use DC input of J1
J8/J21	RF_GNSS interface
J6/J11	RF_LTE interface
J1	5V DC input

Table 2.2 list of TPM541 series interface



3. Starting with TPM541 series EVK

3.1. Hardware preparation and setup

- Attach the included antenna to the SMA connectorJ21
- Plug-in the included DC adapter to DC Jack J1
- Or each UART to USB cable.
- Plug-in 3FF SIM card to J17(back side of EVK)
- Switch on S2(Power switch) to turn on the module.
- There is no need to turn on S2 while using USB cable to power up EVK

Module PWR1 LED will be lighted when power EVK successfully. After modem boot up, the three LED will be lighted.



Figure 3.1 LED status



3.2. Software preparation and setup

• Prepare and install Silicon Lab CP210X UART to USB Driver, Version 6.7

(Please access Silicon Lab website to download driver.)

• Prepare Serial Port Terminal Tool (Putty, SecureCRT, Teraterm..etc)

3.3. Starting to access EVK and TPM541

- a. Turn on EVK
- b. Connect UARTO to PC via USB cable.
- c. Setup Terminal tools, please refer figure 3.3

(COM port: com port will be enumerated on Windows device manager)

✓ 単 連接埠 (COM 和 LPT) ■ Silicon Labs CP210x USB to UART Bridge (COM4)

d. Setting Baud rate for UARTO: default is 115200.

anegory .		
B Seean	Basic splare for your	PuTTY sension
Transa	Secty the destruiter you want	t to barreat to
Fedoard	Setal tree	Special
Def	-CON4	115200
Testure	Convection type:	
: Weidow	C Rev C Ads C Selv C	Big C 314 (6.5
Appearence	Load, save or delets a stored to	-
Terration	Enved Session	
- Selection		
	and the second sec	
Colore	Carala Settings	Gaed.
Coloure Connection Data	Owket Settings	Geet.
Connection Data Proy Tehet	Care & Setings	Save Detera
Colours Connection Data Fruny Teinet Riogen	Default Settings	Greet Sayre Debeta
Colours Data Prury Teinet Plogen # \$34	Default Settings	inere Deben

Figure 3.3 for putty setting.

e. Opening terminal tools and sending AT command from UART.





4. Button/Jumper introduce

4.1. RECOVERY button :

This button is used to enter boot ROM mode for firmware upgrade and recovery system when device cannot boot up by some reason.

Please visit Sercomm technical support website and issue a ticket when you have problem with booting up your TPM541.

4.2. RESET button :

This button is connected to PMU_SHUTDOWN pin for initiating power cycle that resets the device or shutdowns device. (For reset function, please pull low button at least 100ms)

4.3. WAKEUP Jumper :

This jumper is connected to PMU_WAKEUP ping and is used to wakeup TPM541 while device is under power saving mode.

When there is no traffic, TPM541 will get into power saving mode immediately when remove the jumper and TPM541 cannot receive and deal any commands from host. Please plugin the jumper to wakeup module and send AT commands.

4.4. JP18:

This jumper is usage to power by USB or DC(J1) when plugin. When user want to measure the current consumption, please remove this jumper and connect to HV_BAT&GND pin header with current meter for monitoring the current log of module.



5. LED status

5.1. Module_PWR1 LED:

For VCC status indication.

- ON: VCC is present.
- OFF: VCC is absent.
- VCC is provided by 5V to 3.3V LDO.

5.2. Module_LED1:

This LED is controlled by PMU_EXT_ALARM pin, it can be used for alarming an external host.

Output	Conditions
High	Active , LS, DS
Low	DH0, DH1 and DH2

5.3. Module_LED2:

Reserved



6. Special hardware configuration pins

6.1. SWD(JP17):

TBD

6.2. Isolation control(JP3):

3.3V to 1.8V level shift ICs(U3,U10,U11) control :

- H: Turn off level shift ICs
- L: Turn on level shift ICs

Default is connected to Low.

6.3. Debug Selection(JP12):

HW pin for EJTAG chain select :

- PD for MIPS chain.
- PU for ARM chain.

Default setting is internal PD in TPM541.

6.4. Anti Tamper(JP11): TBD

User can connect $\mathsf{PMU}_\mathsf{AT}_\mathsf{OUT}$ to $\mathsf{PMU}_\mathsf{AT}_\mathsf{IN}$ in order to protect its device or module from tampering.

Default setting is floating on EVK.



7. RF matching diagram example

LTE_ANT port is the primary (main) antenna pin and carries TX and RX signals. Connect 50 Ohm transmission lines from this pins to the 50 Ohm Primary Antenna/Antennaconnector. Figure 7.1 shows the connection between LTE_ANT port and the antenna connectors please also follow up matching network to fine tune antenna matching.



Figure 7.1 RF matching typical circuit.



8. Firmware Upgrade

Please access <u>https://supportiot.sercomm.com/</u> to download and install PC Tools for local firmware upgrade. And you will find **ImageBurnTool** in program after finish installation. ImageBurnTool is used for local firmware upgrade via UART_2

In the mean time, please also download images that have two parts need to be installed in your PC/Laptop.

- RK_02_01_02_00_xx
- TPM540G_05.00x

8.1. Install RK firmware image

1. Please create folder "RiceKrispies" under C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor

Thi	s PC > OS (C:) > ProgramData > Microsoft	> Windows > Start M	lenu > Programs	> Altair Semiconductor
^	Name	Date modified	Туре	Size
	PcTools	8/30/2018 6:02 PM	File folder	
н.	RiceKrispies	8/20/2019 1:08 PM	File folder	

2. Install RK_02_01_02_xx which downloaded from Sercomm support IOT website

	18 RK_02_01_02	.00_48		8/20/2019 1:07	PM Appl	ication		16,616 KB
3.	Click Agree but	tton. ₿ RK_02_01_02_00	_48 Setup: Lice	ense Agreement	_		×	
		RK_02_01_0 Agree.	w the license ag 02_00_48. If yo	preement before in u accept all terms	nstalling of the agree	ment, click	I	
			Altair Sen	niconductor I	Ltd.		^	
			Click-wr	ap Agreeme	nt			
		IMPORTANT CONDITION OR USING ("ALTAIR") CHECKING '	- YOU MU S CAREFU THE ALTA SOFTWAH T AGREE "	ST READ TH JLLY BEFO JR SEMICO RE ("SOFT YOU ACKN	IESE TERI RE INST ONDUCTO WARE"). IOWLEDO	MS AN ALLIN DR LTI B FE THA	D G D. Y T *	
		Cancel	Nullsoft Insta	ll System		I Agr	ee	



4. Click Close after installing completed

17		U.
Show details		

5. Unzip Sercomm firmware image "TPM540G_05.00x.zip" that downloaded from Sercomm support IoT website.

Plante	Date modified	Type	Size
AppFW_flash.bin	7/31/2019 540 PM	Bird Kin	3,660 KB
ConfigFS.bin	7/31/2019 540 PM	BIN File	512 KB
] partmap.bin	7/31/2019 Sab PM	mpartae	-4.63
ysHeader.bin.alt1250	7/31/2019 5:40 PM	ALT1250 File	4.80
sysHeader_backup.bin.alt1250	7/31/2019 540 PM	ALT1250 File	1.02
u-bootbin	1/31/2019 5:40 PM	HIP/File	385 KB
ue_the.fw	7721/2019 S-45 PM	FW File	3,671 KH
🗋 ue_tte.fw2	7/31/2019 540 PM	FRI2 File	2,730 88

6. COPY all files and replace files under folder path: C:\Program Files (x86)\Altair Semiconductor\RiceKrispies\RK_02_01_02_00_XX\Images

Note :

a).For 64bit windows OS, the folder path is

"C:\Program Files (x86)\Altair Semiconductor\RiceKrispies\RK_02_01_02_00_XX\Images" b).For 32bit windows OS, the folder path is

"C:\Program Files\Altair Semiconductor\RiceKrispies\RK_02_01_02_00_XX\Images"

anve	Data modified Type Size
AppFW_flah.b	ETLATING LATING BALTING AND
ConfigF5.bin	🖌 Replace or Skip Files 🛛 — 🔃 🗙
) ic_connectivity) partmap.bin) sysHeader.bin.	Copying 8 items from ASC(001-000 F000000000 to images The destination has 8 files with the same names
ysHeader,bac uart_init_1250	Replace the files in the destination
u-bost.bin.sys	9 Skip these files
u-boot.hin_dH u-boot_vm.bin u-boot-cin.hin	🖏 Let me decide for each file
Gue,tte/w Gue,tte/w2	🕑 Ferry Attalls
um update hdet	AND



Now, all the necessary firmware images are installed well in your PC/Laptop.

8.2. Environment setup

Local upgrade is flashed the firmware through local UART_2 port.

Please follow this instruction step by step to setup your environment for upgrade.

8.2.1. Open your UART_0 with terminal tools.

- a. Turn on EVK
- b. Connect UART_0 to PC via USB cable.
- c. Setup Terminal tools, please refer figure 7.2.1. COM port: com port will be enumerated on Windows device manager

✓ ∰ 連接埠 (COM 和 LPT) ∰ Silicon Labs CP210x USB to UART Bridge (COM4)

d. Setting Baud rate for UARTO: default is 115200.



Figure 7.2.1 for putty setting

8.2.2. Setup BootDelay time to 10s

Before we start to upgrade firmware, TPM541 need to be configured the boot delay time to 10s by sending AT%SETBDELAY=10 through AT port(UART_0) to make sure Image Burn Tool has enough time to put TPM541 into UBOOT mode for firmware upgrade.



8.2.3. Connect UART_2 to PC

UART_2 is also used to upgrade TPM541 firmware, be sure UART_2 is connected well with USB cable between PC and EVK.

8.2.4. Enter U-BOOT mode

a. TPM541 series firmware upgrade need to be executed under u-boot mode. So user shall login UART2 to interrupt boot-up procedure and force TPM541 into u-boot mode for flashing image. After reboot the modem, the modem boot delay will be 10sec. Please process the steps as below.



b. After power to the module. User need to **"Hit any key to stop autoboot"** within 10s and you will see "#" prompt that means TPM541 is successfully into U-BOOT mode.



Before starting flashing image, User need to disconnect the connection between UART2 and terminal tool.

8.3. Firmware upgrade with ImageBurnTool

This chapter is introduced how to setup configuration of ImageBurnTool. ImageBurnTool is used to upgrade your TPM541 through UART_2, please make sure all steps are done.

8.3.1. Setup "ImageBurnTool"

a. Execute C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor\PcTools\ ImageBurnTool.exe



O insigniture front						- D K
Th. 101 Dec. 10	and been her man	e				100000
- 1000	ar Pal				Channel 1	Oltair
				1		
a transmittania						
tunin farme the						
0.042700						
Contrast PR	The land out			-		
C. Manager Tory	and built map					
Cimmer.	(tring (minute in any					
Rows Tames	Cold State of State					
And inches		Anna C				
	dher	Sector .	-			
		-	-			
				3.		
			100	1.000		

b. If you already have installed RK image well, ImageBurnTool will detect latest RK image automatically in "Version"



c. Please go through all steps of chapter 7.1 again if tool cannot detect firmware version. Or you can select the version manually.



Then you need to select images that need to be upgraded.

Here we recommend to upgrade all parts **EXCEPT "Configuration FS"**. **Be Caution, to upgrade "Configration FS"** that will cause all calibration data are erased after firmware upgrade.

Please select "System Header, U-Boot+Env and Flexible Partition Map", above three images would be auto select, once your click any of each.
And Application FW, Modem FW1 and Modem FW2 SHALL be selected as well, Modem FW1 is used for CAT-M1 firmware and Modem FW2 is for NB-IoT.



Active Bank		
Application FW	Using Default Image	
Modern FW 1	Using Default image	
Modern FW 2	Using Default Image	

Warning, DO NOT select Configuration FS, in case the calibration data will be erased after firmware upgrade.

8.3.2. Setup "Burn Options"

Currently TPM541 series only supports Firmware upgrade through UART, USB hasn't supported yet. Please select COM NO. With UART_2 and also enable Flow Control with RTS_CTS.

USB:	Serial Number	Default	 UART	COM	COM163	
	Set And Burn			Baud Rate	921600	
				Flow Control	RTS_CTS	

8.3.3. Start to upgrade firmware

a. Click "Burn" to start firmware upgrade

 Senial Number (Octaut:	(e) UART	COM	COM163	
Set And Burn		Baud Rate	921600	
		Flow Control	ETS_CTS	

b. After click "Burn", ImageBurnTool will pop-out tip to inform user to reset TPM541.



Please reset EVK by push "RESET" key and close box immediately



c. Starting firmware upgrade.

SER



d. Upgrade status check, you can find status report at left-bottom side.

	Bun	Cancel
Writing image "AppFW_flash.trin" to device (0ITs completed).		

e. TPM541 will reboot automatically after upgrade complete, and it will take around 3mins to do configuration. Please check AT commands response in UART_0 COM port.

Write: loado modem_tw2 Done.
Read: 3 \fpattern(## Ready for binary (kermit) download*) with timeout 3000 Done.
Send: C:\Program Files (x86)\Altair Semiconductor\Ricekrispies\RK_02_01_02_00_48 \Images\ue_lte_fw2 Senders C
Sending file This might take a while please wait Done.
Read: 120 \fpattern(## Start Addr*#) with timeout 120000 Done.
*** Second phase completed ***
SUCCESS: The burning process completed successfully
Complete
Resetting device



9. Message view and Debug view usage

This chapter is introduced how to use message and debug view to investigate and collect log from TPM541. The message view is used for monitoring the Network message and debug view is used to collect TPM541 modem log for Sercomm debug.

Before starting to use message and debug view, user need to setup "Configuration Tool" by follow instruction step by step. And both tools are using UART_1 for collecting logs.

9.1. Configuration Tool Setup

Please connect UART_1 port via USB cable between TPM541 EVK and PC well. Execute "C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor\PcTools\ Configuration Tool.exe

a. In Products page, select correct RK version that downloaded from Sercomm supportIoT website.

Products General Sockets Drivers Versio	na	
Product to use	RK_02_01_02_00_40	Ψ.
Use USB interface 1250	0	
Use second image		



b. In General Page, select UART_1 COM port NO, Click "SAVE" button then clicking "Restart and Close"

Products General Sockets Drivers Ven	sions	a second second	
Max Spe of FW BIN Logs (Bytes)	5000000	÷.	
Max Count of FW BIN Logs	40		
Max Count of FW CSV Logs	50		
FW Logs Feth (Defenit if empty)			
FW Logger DB Path (Default if empty)	i —		
Um EMUX 1250	0		
Device FW Logs Interface	COM163	~	
Device RTOS Logs Interface	none	9	
Device Debug Interface (CLI / EMUX)	none	v	
Device AT Interface	none	~	
Device FW Logs Band Rate	921600	~	
Device FW Logs Flow Control			
	and the second		

c. Click "Yes" to save changes





9.2. Debug view

a. Please execute the clear all session file first

"C:\Program Files (x86)\Altair Semiconductor\PcTools\RemoveDebugData\RemoveDebugData.exe" to make sure that the logs is latest and press "Y" for processing.



b. After setting up configuration tool, user can execute "C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor\PcTools\Debug View.exe to collect and save debug log.

Pile	Sat Capture	e Options Computer	Help				
-	E2 14 4		175 PM	1	1.1.44		
-						•	
	Text	Endoug Fried					
1000	the latter latter.	# 2000 DOWN OF 1		10000	100.0		A REP. Machines, in proceedings, in the last of the last Wilson Wilson Wilson and some office in this of
100	22.0000.0012	2,0,000,000,000,000		1213001	11.7*	1002000	1. Dery Canadian and Construction, Herris 121 (2018). Willing Co. Marcine and Herris March 1998. No. 11, 111 (2018). Annual Science of Construction (2018). In Construction (2018) 111 (2018). In Construction (2018). In C
1000	10.000	1.2010 201718-2	1.1.6.80.00	10000000	100 million	10000	March 1917 Surger State and State an
1000	21 10 10 10 10 I	1 2000 2000 to 1	116.000	100000000	COLUMN T	COLUMN TRACT	PERCENTRAL AND A DESCRIPTION OF AN ADDRESS AND ADDRESS ADD
1000	TO DRIVE WHEN	1 2000 2000 to 1	110.000	10000000	COLUMN 1	COLUMN TRACT	AND CO. THE PARTY COMPARED AND AND AND AND AND AND AND AND AND AN
1000	TO DESIGN	1 YOM 1 YOM 18 1	14.80.00	11000000	Children of Contract	IN TRACTS	And the second s
NOT 1	10.18480/277	OT REAL PROPERTY AND ADDRESS.	01 177.5d	I TRAN	100760	NO. BOT	Charl COL configure care Visite 1 Marcharl Marcharl and a Visite Core 1 and deaths the PAP should also The LOCHE LLA MOTORE
NO14	IO NEO TINE	1 2000 X014 (8.3	12.0.2	1216.51	These 1	DOCTORY IN	\$20 Years for \$1.00 and the set of \$1.00 as home whereas \$20 for \$ shall a larger 1981 100 TH 10.
1000	IO NEWSCOTT	10000 0014-08-5	11446	12010-01	that.	IN TRACK	DB111 "emilence" in doint of white the I managine a full that individually and 110" shall a backney 141.
100	to heroforda	1 3000 XXXX III 3	124.6	1 Studes	(htm)	IN TRACT	WARNED for our contraint, our data looks with relation on 1 doors has called to doate. DOX: Also 1.0, other, DOA
100	12 1403 1402	0.0000 0014-08-0	110.000	e Principal a	(Max)	10110344	NO. Service Intel 18, West advocation and wathin 18, New Jacobs NE, West Jacobs Jacobs Decisions NE .
ACT N	12.168604	2,0342,003-08-2	6163002	1258001	DAM: N	14275547	NO. New Example ROLL, print advantage and advantage (*, Abult A. Institut, 2, 1905, LORDER, LtA, MODILE)
KO19	2010071102	0.2094 2015-18-2	616,9002.	1258001	IMAC.1	DEDREAD.	190. TOM-AT Outsidner-AT ONLINE COMMENT, a sugge, 10. 1200/ER AT MODULE
10.00	10000060	2209 2011 (8.2	616.8002.	125801.	IMAC.	194.0885.00.	BPO. TEM+AT_EM Oundate-AT_EM_CHLMLCOMMADY, n. June 1, 107 (2008), AT_MODULE
× 811	200809300	[12094] 2009-08-2	616.8002.	1258001.	IMAC.1	1041385138.	BPO. PDM-BRDD Outselline-BRDD MRCaugeDoOF, BRC, pain. J. 107, 120008, BRC, BRDDDD
1.8.2	3100964290	2004 2004 08 2	616.80CE,	127801	IMAC,	104.085.60	NPO, Will- KCPE Complete RCPE, ORDerint", NRC, pages, NP, LODGER, NRC, MODILE
100	11/00/06 (200)	209 209 8 2	#18.80G2,	127803	IMRC,	DUTIENDE.	BPO, Wile-GE Controllers-CE, Compellinguily, 107, pages 117, 200300, HEC MODULE
1.810	110000270	[2096] 2019-08-2	# 18 80 GD	LPT BOLL	IMAC.	10413655627	DPC TEM-DESCONDENCES DES DP ABC man, 107 LOCOR DEC MODULE
1.01	1000041794	[209] 209-IB-2	618-60G),	LITERAL .	Distance.	IN CREEKES.	BPO, Wilds BEC, Danak Controllers, HC, Danak Arter, BEC, name, VF, LOGER, HC, MUDAL MAN, and DEC, March Controllers, HC, Danak Arter, BEC, Name, VF, LOGER, HC, MUDAL MAN, And MAN, AND
200	Victoria and	1000 00000	1000	Canal -	1200	CO COLORA	BPD, Tible-DD, PKY and DB, DL, NR, ANK, DE, DB, ANK, DY, DANK, M. (2014).
205	00011002	10000 00000	12221	- IGECI-	12221	in the second	NO. 1914. HAR CONTRACTOR AND THAT DESCRIPTION AND AND ADDRESS OF TAXABLE AND ADDRESS ADDRE
222	COLUMN T	1 0000 000 IE 0	12202	1120001	12201	COLUMN.	AND THE PLATE AND A DESCRIPTION OF A DES
200	THE REAL PROPERTY.	COMPANY AND A DECIMAL OF	1222	1000001	inger (of the last	NOV WALLAST DOP CONTRACTOR FOR THE STATE OF THE CONTRACTOR FOR THE CONTRACTOR
and the	1102271621	1,2362,233-08-0	14,40.00	1213031	these."	the treatment	1997. TOA-160. Annal Consultant Mill Dank Aller, No. and J. M. 2008. No. MILLIE
10102	20028082	12091201-092	16.000	121303	UMAC.	1041381892	190. TOM-IGN Construction IDN MARKER ACTIVE PROCEEDING TOMERACTION BIACTIVE AND ADDRESS STOLED DR.
10103	2012/201804	1,20ml 2004-08-2	2008.4116	121303	DARC: 1	1041383.045	100 YOM-MT 2000 Connection-MT 2000 MT 2000 ELLP 2000 100 LOCKIDE NAZ INCIDELE
8,775	10.0329780	120H 201H 8 2	616.80.02	121801	IMAC.	DEDEMES.	100 YOM-NO DMI Consultant-NO DMI NO DMI DLF NAZ minto 100 LOODER NAZ MODULE
8,771	2103.0610	2019-18-2	618-80-02	127803	IMAC, I	DUDENS.	100 YOM-MY DIC Complete MY DIC BY DIC DIF 1442 man. 10 LOCHE RAC BODILE
8,755	2042034468	[1208] 2019-IB-3	618-80-02	127803	IMaC.	DEDEMEN.	NPO_PERIODELLA_DATABASENED_D
8,027	THOUGH PROPERTY	[2090 2015-IB-2	618.5002.	Lithout.	IMaC.	DEDEMED.	NPO. WIM-HAC DR. Anne: Cumultum-Hall DR. Anne: Annet "JAAC maker, OIL LOODR JAAC MCDULE
8,078	0.0010109	E5088 50 Pre-	6666	igner.	IMAC.	IN TRACK	NPC point index(6) million() antiliand) random (7, manuar, 83, LOCOB, 77, MCDUB)
5.02	0.000	1000000000	1522	-10221-	1200-	1010008-	NYO, possi komod ne natalood gentano- yanakood", imanaz, P.S. LOGGE, PTS MUDAL
0.07	0.00000	E 6095 602-18-6	115278-	102001	1255-1	1512202-	Priv. prise inclusion manager and and set of an and the set of the
021	0.000	E-6095 000-18-0	12223	142,0001	12220-1	1212200-	Server a server and the server in an and the server of the
1000	100000000000	2000 200-00	1202	Latingal .	COLUMN	THE CONTRACTOR	Fig. And a state of configure in property in the state of the state
10.00	THE PART	1204 2014 8	114,80/10	12530.011	these."	DR LINNIN.	FIGU. And An Andrew Comparison of the Annual Comparison of the Annual Society of the Annual Society of the Annual Annual Annual Society of the Annual Annua Annual Annual Annu
K H	212.8780	2 2081 203-08 2	14.800	121301	DAM'	IN CRIMES	190 and State-Continent and and an investor " statement in LOOM TO MODEL
14120-0	110106714	12080 2009-08.2	14.10.00	121800	DANC'	THE EVENINE'S	190 mild inderfload antihod antihod on the of antihod
KHT	11/10/190	1209 2019 (8.2	20-08-813	127803	DANC.	DOTEME.	100 milef Solid and and and and an identify reasons, 03, LOCOB 177 MID/LB
1088	2010/0812580	1209d 2009-08-3	0.06-61-6	1218003	IMaC.	INTERNE?	190 paid/field/solid-antilest prolined matiles?" renews, 01, LOODS _VT_BCD13.8
1085	TO CARDE HIS	[13090] 300%-08-3	\$18.80.00	127803	Dist.	IN DEMIN	NPO, pedal i sinite-i ranifesti profilesti manifesti", remena, 181, LOOOB, PVE MCDUB
1000	110102030	E 2010 2014 (8-3	616-66-66	1278641	TMaC	IN TRACO	NO web/Distant Doubles/Depthweb/continent/ reserve Ht 100000 200 MODER



9.3. Message view

After setting up configuration tool, user can execute "C:\ProgramData\Microsoft\Windows\Start Menu\Programs\Altair Semiconductor\PcTools\Msg View.exe to collect and save message log.

wonge Legging	5x <> 34		- 800
funestamp Lish SAAC RLC	FOCP RECIPON IN	45	
16.52.53 (2063682217)		systemistromationElock7ype1-BH-r12	
16.52.54 (2083081203)		systemic formation fillock Type 1484-432	
16 52 34 (208372-1238)		systematic (Ref)	
16 52 54 (2063722230)		typiandulumation (Mirt)	
16.52.54 (2083)22398)		wymanetechnergamos-896.+13	
16 32 34 (2063727879) +		ATTACH FEIDUEIT	
16 52 55 (2083/48942) +		er/Convertantilegant	
16.52.55 (2084326290)		security Mode Dominand	
16 52 55 (2084822942) +		secure/ModeComplete	
re 52 TE (2069034887)		u+CasdultyE+ars	
18.52.55 (20000381/0) ·		u+Capation, education	
16 52 55 (2083/548/0)		Inclusion-thurPactors gardient	
16 52 55 (2001109040) +		erConnectonRecord press Complete	
16 52 55 (20851599 Im)		ATTACHACCEPT	
16.52.53.(2082)K2440) +		ATTACH COMPLETE	
re 52 35 (2001162894) +		utellorration Transfer	
18.12.03 (COEN400078)		determine harder	
16 12 13 (2083492712)		EMAINFORMATION	
16 53 03 (2055)(71142)		erConvectorRelate	
16 51 69 (2095471287)		manufacturestantified	
16 53 06 (2005600011)		water by the mail of Block Type 1 (11) (12)	
16 T3 26 (204)(8120)		to the shake the set of the set of the set	

9.4. WiresharkMSGview

9.4.1. Install Python and Wireshark tool

WiresharkMSGview tool can used to collect packet with installed wireshark tool in user's PC. Before executing WiresharkMSGview, user need to install python and wireshark tool in PC. For python, user can access website below to download python 2.7 version. https://www.python.org/downloads/release/python-2716/

9.4.2. Enable wireshark configuration by sending AT command

a. After installing python and wireshark, user need to enable TPM541 All2msgv configuration by sending AT command at%exe="config -s modem_apps.LteSniff.All2msgv 1" via UART_0 com port.

at%exe=″config -s	modem_apps.LteSniff.All2msgv 1″
Done	
OK	
atz	
OK	

b. Then performing ATZ to restart TPM541 to enable All2msgv configuration.



9.4.3. Execute AltairWiresharkMSGview

User can execute following path to run program.

C:\Program Files (x86)\Altair Semiconductor\PcTools\AltairPyTools\AltairWiresharkMsgview

No.		Time	TTI		TimeThong To	Source	Dectionation	Length	Paoloce	il –		CID	Info	~
	21	17:14:55.009000		4229	877055319	4.4.4.4	4.4.4.4	63	LTE R	RC	UL_DCCH/NAS-EPS		RRCConnectionSetupCompl	
	22	17:14:55.168800		4272	877099026	7.7.7.7	7.7.7.7	63	LTE 8	RC	DL_DCCH		SecurityHodeCommand	
	23	17:14:55.230000		4274	877100964	4.4.4.4	4.4.4.4	54	LTE 8	RC	UL_DCCH		SecurityModeComplete	
	24	17:14:55.293000		4336	877163034	7.7.7.7	7.7.7.7	85	LTE 8	RC	DL_DCCH		RRCConnectionReconfigur	
	25	17:14:55.496808		4339	877166888	4.4.4.4	4.4.4.4	58	LTE #	RC	UL_DCCH		RRCConnectionReconfigur	
	26	17:14:55.589000		4853	877680138	8.8.8.8	18.59.62	136	ICMP			1	Echo (ping) reply id	
	27	17:15:05.556800		4850	887917315	7.7.7.7	7.7.7.7	58	LTE R	RC	DL_DCCH		RRCConnectionRelease [c	
	28	17:15:06.556000		4941	888806451	7.7.7.7	7.7.7.7	50	LTE R	RC	BCCH_BCH		MasterInformationBlock	
	29	17:15:06.869000		4949	888015378	7.7.7.7	7.7.7.7	153	LTE R	RC	DL_SCH_BR		SystemInformationBlockT	
	30	17:15:07.110000		4951	888016525	7.7.7.7	7.7.7.7	153	LTE R	RC	DL_SCH_BR		SystemInformationBlockT	
	31	17:15:24.490000		3224	906943843	10.59.62	8.8.8.8	109	DNS			1	Standard query 0x5db4 A	
	32	17:15:24.552000		3224	906944748	4.4.4.4	4.4.4.4	54	NAS-E	PS			Service request	
	33	17:15:24.755000		3224	906947629	4.4.4.4	4.4.4.4	62	LTE B	RC	UL_CCCH		RRCConnectionRequest	
	34	17:15:24.834000		3436	906982888	7.7.7.7	7.7.7.7	105	LTE 8	RC	DL_CCCH		RRCConnectionSetup	
	35	17:15:25.036000		3448	986986217	4.4.4.4	4.4.4.4	63	LTE #	RC	UL_DCCH/NAS-EPS		RRCConnectionSetupCompl	
	36	17:15:25.099000		3499	987846857	7.7.7.7	7.7.7.7	63	LTE R	RC	DL_DCCH		SecurityModeCommand	
	37	17:15:25.162000		3501	907048010	4.4.4.4	4.4.4.4	58	LTE R	RC	UL_DCCH		SecurityModeComplete	
	38	17:15:25.224808		3536	907083057	7.7.7.7	7.7.7.7	85	LTE R	RC	DL_DCCH		RRCConnectionReconfigur	
	39	17:15:25.412000		3539	907086083	4.4.4.4	4.4.4.4	58	LTE R	RC	UL_DOCH		RRCConnectionReconfigur	
	40	17:15:25.505000		3985	907532166	0.0.0.0	10.59.62_	141	DNS			1	Standard query response	
	-41	17:15:25.568800		3987	907533966	10.59.62	104.28.1.	96	TCP			1	64656 + 80 [SYN] Seq=0	
	42	17:15:25.771000		4689	908156211	104.28.18.	10.59.62	96	TCP			3	80 + 64656 [SYN, ACK] S	
	43	17:15:25.833000		4610	988157836	10.59.62	104.28.1.	92	TCP			3	64656 + 88 [ACK] Seq=1	
	-44	17:15:25.896808		4611	988157869	10.59.62	184.28.1.	146	HTTP			1	GET /json HTTP/1.1	
	45	17:15:26.146808		4993	988548146	184.28.18.	10.59.62	92	TCP			1	80 + 64656 [ACK] Seq=1	
	-46	17:15:26.568800		5441	988988853	184.28.18.	18.59.62	635	HTTP			1	HTTP/1.1 200 OK (appli	
	47	17:15:26.646808		5487	909033898	10.59.62	184.28.1_	92	TCP			1	64656 + 80 [ACK] Seq=55	
	48	17:15:36.970000		5561	919348304	7.7.7.7	7.7.7.7	58	LTE R	RC	DL_DCCH		RRCConnectionRelease [c	
	-49	17:15:38.001000		5671	919456486	7.7.7.7	7.7.7.7	59	LTE R	RC	BCCH_BCH		MasterInformationBlock	
	58	17:15:38.313000		5679	919465393	7.7.7.7	7.7.7.7	153	LTE R	RC	DL_SCH_BR		SystemInformationBlockT	
	51	17:15:38.532000		5681	919466517	7.7.7.7	7.7.7.7	153	LTE R	RC	DL_SCH_BR		SystemInformationBlockT	
	52	17:15:56.544000		4584	938989196	10.59.62	104.28.1.	92	TCP			3	64656 + 80 [FIN, ACK] 5	

9.5. Collect Logs of modem

It is the modem logs of Altair format. User can capture the logs via UATR2 and provide the files to SERCOMM AE for analysis.

Note :

a. The logs should start at modem boot-up to the end of test and save it. You can press "ENTER" bottom and get ">" symbol to make sure that the modem is work.



	I. COM143 - Tera Term VT	-		×	l
1	File Edit Setup Control Window Help			_	ľ
	Mar 03 00:28:32.050 [D4] [INIT][0.82012] Setup rx_tx_interrupt_fo Mar 03 00:28:32.050 [D4] [INIT][0.82043] Calling Irq_moveInterrupt	t ToH	H2O	= ^	
	Mar 03 00:28:32.050 [D4] [INIT][0.82088] Open UART-A base = 0xbc1:	1800	0 cfs	9	
	Mar 03 00:28:32.050 [D4] [INIT][0.82136] Setup rx_interrupt_only f Mar 03 00:28:32.050 [D4] [INIT][0.82205] serialMngrOpen:399, device bb1d0	for ce=A	uart Øx9d	e Ø	
	Mar 03 00:28:32.050 [D4] [INIT][0.82228] Setup UART A in Tx block: Mar 03 00:28:32.061 [D4] [INIT][0.93482] lwip_stats ready Mar 03 00:28:32.250 [D4] [INIT][0.282394] HIFC HOST TO_MODEM GPIO Mar 03 00:28:32.250 [D4] [INIT][0.282525] HIFC configured gpio HO Mar 03 00:28:32.250 [D4] [INIT][0.282525] HIFC configured gpio HO	ing ST_T	mode HIGH 0_M00	ЭE	
	Mar 03 00:28:32.250 [D4] [INIT][0.282565] Cause of last reset: 0x0 Mar 03 00:28:32.251 [D4] [INIT][0.283239] CLI AI cmd buff len is 3 Mar 03 00:28:32.251 [D4] [INIT][0.283546] Send TPM540Ready Success Mar 03 00:28:32.354 [D4] [INIT][0.385971] LteDriver - init task en Mar 03 00:28:32.354 [D4] [INIT][0.423461] 1st AI cmd: AT/DEVINF0=	30 3092 Ided SIL	ICONI	1D	
				~	

b. We use the "TeraTerm" as example and choice "Log" for saving.

COM143 - Tera Term V	π			- D X
Edit Setup Contro	Window	Help		
New connection Duplicate session	Alt+N Alt+D	t641	tiNitit	0.82043] Calling Irq_moveInterrupt_for uart 1 0.82043] Calling Irq_moveInterruptToHW2() w
Cygwin connection	Alt+G	[D4]	CINITIC	0.82088] Open UART-A base = 0xbc118000 cfg
Log Comment to Log		[D4] [D4]	EINIIIE	0.82136] Setup rx_interrupt_only for uart 0 0.82205] serialMngrOpen:399, device=A 0x9c0
View Log Show Log dialog		[D4] [D4]	EINIIIE	0.82228] Setup UART A in Tx blocking mode 0.93482] lwip_stats ready 0.2822991 HIEC HOST TO MODEM GPIO 1. HIGH
Transfer		[Ď4] =17 mo	tiNitit de=C	0.2825251 HIFC configured gpio HOST_TO_MODE
SSH SCP		[04] [04]	EINITIE	0.282565] Cause of last reset: 0x80 0.283239] CLI AT cmd buff len is 3092
Replay Log		[D4]	EINITJE	0.283546] Send TPM540Ready Success 0.385971] LteDriver - init_task_ended
TTV Record		[D4] Msec	CINITIC	0.423461] 1st AT cmd: AT%DEVINF0="SILICONID
TTV Replay				
Print	Alt+P			
Disconnect	Alt+I			
Evil	Alt+O			

c. Please add "TimeStamp" option and press save.

Option	
Binary	Append Plain text
Hide dialog	Include screen buffer
✓ Timestamp	Local Time \checkmark

d. Please send "collectLogs" to do the logs capturing.





e. When the processed done, you will can get the "=== Collect Logs - END ===" string. Finally, please send "at at%ver" to get the modem FW version and save the log file.





				_
	COM143 - Tera Term VT	-	×	
1	Ele Edit Setup Cantrol Window Help			ľ
	mmands.		^	l
	>at at%ver			I
	AT atzver			I
				I
	NP Package: IPM5406_05.006			I
	Using APP processor - no SB or 3B versions			I
	MAC Revision: REL_1250_02_01_02_REV_222417			I
	MAC Build Time: Jan_14_2020_23_08_52			I
	PHY Revision: 12.50.222182 10 F4 20			ı
	PHY Build Time; Jan_09_2020_13_54_32 PHY Build Info; releas 0			I
	PMP Revision: 222417			ı
	PMP Version: 69_FH PMP build time: Jan 14 2020 23 08 52			ı
	DSP_Revision: 56263			ı
	BB HP Devision: 20			ı
	RFIC_6200_Revision:_00			I
	NP Build Time: Jan 21 2020 15:22:13			
			- ×	21



Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter is certified under the standalone operation condition and may not be installed to co-transmission with other transmitter without separate reassessment. It is OEM/Host manufacturer's responsibility to conduct a separate compliance reevaluation for confirming that final system continuously complies with the applicable FCC rules under that circumstance.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.



This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:

This module has been tested for compliance to FCC Part 24, 27.

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

Any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

The antenna must be installed such that 20 cm can be maintained between the antenna and users, and the maximum antenna gain allowed for use with this device is 1.7dBi for band 2 and 4, 1.2dBi for band 12. Only dipole antenna can be used for this device.

The final end product must be labeled in a visible area with the following: "Contains FCC ID: P27-TPM541". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule



requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

OEM/Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.

